



Trending Insights

—

The business value of AI

Peak performance
during the pandemic

IBM Institute for
Business Value



How IBM can help

Clients can realize the full potential of artificial intelligence (AI) and analytics with IBM's deep industry expertise, technology solutions, and capabilities and start to infuse intelligence into virtually every business decision and process. IBM's AI & Analytics Services organization is helping enterprises get their data ready for AI and ultimately achieve stronger data-driven decisions; access deeper insights to provide improved customer care; and develop trust and confidence with AI-powered technologies focused on security, risk, and compliance. For more information about IBM's AI solutions, visit ibm.com/services/ai. For more information about IBM's AI platform, visit ibm.com/watson.

Key takeaways

More than 85% of advanced adopters are reducing operating costs with AI

Executives report operating cost savings from AI across numerous areas. 47% have realized cost improvement in process efficiency, 41% in supply chain and production, and 39% in headcount efficiency improvements.

Advanced AI adopters attribute 10-12% points of revenue gains (or erosion offset) to AI

Companies report 6.3% points of direct revenue gains directly attributable to AI on average, which offset revenue erosion for those hit hard by the pandemic or helped capitalize on new growth opportunities for those seeing greater demand.

Virtual agent technology alone accounts for significant financial and operational benefits

99% of companies report reduction in cost per contact from using virtual agent technology—estimated at \$5.50 cost savings per contained conversation.¹ This corresponds with a 12 percentage point rise in customer satisfaction and a 9 percentage point rise in agent satisfaction, along with 3% revenue gain.²

As business leaders navigate a succession of pandemic-fueled transformation imperatives, artificial intelligence (AI) continues to enable organizations to address urgent and immediate business priorities—quickly and at scale. AI improves a company's cost base—augmenting human capability to motivate greater and more expansive efficiencies. And AI helps enhance or protect top line revenue, experience and engagement. With its value-expanding impact on both sides of the financial equation, the essentiality of AI is clear, both in and before the current crisis.

Our six-year data series shows that COVID-19 has accelerated AI's shift from experimental to widely adopted as a key lever of sustainable competitive advantage and profitability across businesses and industries around the world.

These and other AI-related insights are confirmed in a new global survey by the IBM Institute for Business Value (IBV), conducted in collaboration with Oxford Economics during the first few months of the COVID-19 pandemic. With participation of 6,700 C-level executives across 13 business functions, 28 industries, and 46 countries, the IBV's third biennial survey on enterprise AI reveals significant advancement in the maturity and use of AI technologies and related capabilities.



84%

of executives expect a steady or increased level of organizational focus on AI.



67%

say COVID-19 disruption accelerated specific transformation initiatives that previously met organizational resistance.



60%

of the C-suite are accelerating digital transformation during the pandemic.

Key insights from the new data include:

- *AI is an economic accelerator.* As the pandemic continues, AI adoption has become positively correlated with superior business outcomes in revenue, cost, and profitability – and this finding holds across industries and regions.
- *AI’s financial impact has become clear.* Business leaders now acknowledge that investments in AI bear a direct relationship with financial gains from the use of AI.
- *An all-in commitment to AI pays off.* Advanced AI adopters achieved proportionately more financial value from AI technologies.
- *Investment in foundational AI “readiness” speeds time to value.* Investing in capabilities that are necessary preconditions of AI—data, process, and human capital—speeds progress to more advanced adoption and time to value.
- *AI “readiness” capabilities yield near-term financial results.* Strategic, broad-based investments in AI-enabling capabilities—staged along a path of AI-specific initiatives—deliver value in their own right. Companies begin realizing value even before AI is introduced.

For organizations navigating the pandemic day by day, this fifth point is possibly the most intriguing. While it’s clear that an enterprise’s path toward greater maturity is neither simple nor immediate, the AI journey can begin with tangible steps. For example, deploying an AI-enabled virtual agent or re-optimizing demand forecasting with an intelligent recommendation engine can quickly achieve positive returns.

And this “low-hanging fruit” not only yields value today, it sets the stage for additional accelerated value from AI in the future.

As with other actions in the current state of emergency, pursuing new insights around AI is a must. Nearly all executives surveyed say they anticipate ongoing business turmoil. Many tell us that operating efficiency is actually increasing through the pandemic. Yet those same executives are articulating intensifying fear that the extent of innovation is declining. Rapidly.

Turning a destructive environment into a catalyst for AI ingenuity can redress concerns about declining innovation, helping leading AI adopters define winning strategies of tomorrow.

Turning a destructive environment into a catalyst for AI ingenuity helps define winning strategies of tomorrow.

AI is having a (bigger) moment

From the first academic conference in the 1950s that gave AI its *nom du guerre*,³ the field of artificial intelligence has been characterized by successive boom-and-bust cycles. Early speculators saw investments frozen by a series of AI winters. It has therefore been wise to view pronouncements or predictions about the ubiquity of AI with caution. Even after technology firms stepped up their interest in AI during the late 1990s, progress remained start-and-stop. Despite Deep Blue checkmating Kasparov in 1997,⁴ and Watson cleaning up on Jeopardy! in 2011,⁵ wide-ranging commercialization of AI has been slow to emerge.

But this has changed in a few short years. Advances in deep learning and other machine learning techniques have cracked the AI floodgates open. AI's stock has soared since 2015. AI-native startups have proliferated. Industry incumbents who were slow to pick up on the renewed importance of AI have had the necessity of AI thrust upon them—even as they were grappling with realizing the full benefits of investments in big data, business intelligence, and advanced analytics.

Within this environment, a core set of technologies with AI at its center have proven especially vital during the pandemic. A few key trends relevant to AI have emerged as especially important, as reported in a recent IBV study examining the impact of companies' digital transformations on their financial performance in the midst of the pandemic:⁶

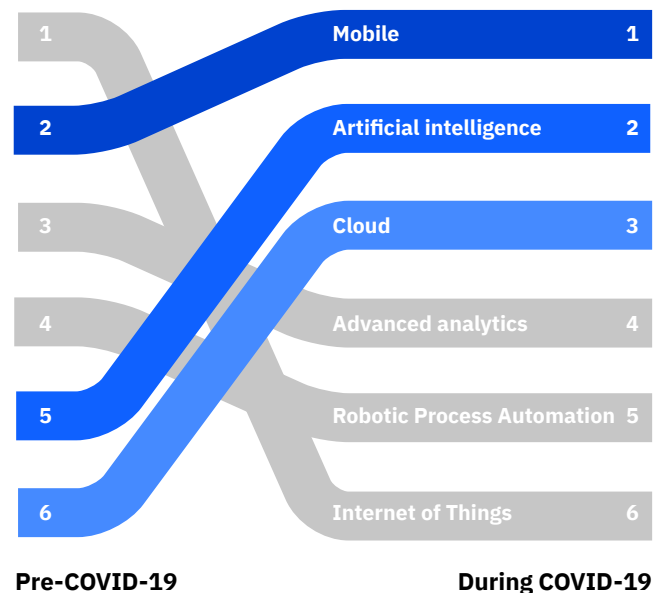
- *Digital transformation is accelerating*: 60% of C-suite executives say they are accelerating digital transformation during the pandemic, and fully two-thirds say the pandemic has allowed them to advance specific transformation initiatives that were previously encountering organizational resistance.
- *Tech-savvy companies are outperforming*: Organizations that had already embedded technology deeply and meaningfully into business operations and processes have consistently outperformed peers in revenue growth by 6 percentage points, on average, during the pandemic.

- *AI, while central to transformation, remains under-exploited*: Successive analyses by the IBM Institute for Business Value has revealed that mobile apps, AI, and cloud provide the greatest performance impact across industries through the pandemic (see Figure 1). But while capabilities around mobile and cloud are relatively mature in many organizations, those around AI typically are not. AI therefore offers the biggest marginal opportunity, especially in industries such as life sciences, banking and financial markets.

Figure 1

Across industries, the mix of critical technologies to performance contribution before and during COVID-19 has changed dramatically

Ranking of technologies according to revenue impact



Source: "Digital acceleration-Top technologies driving growth in times of crisis." IBM Institute for Business Value. November 2020. <https://ibm.co/digital-acceleration>.

Insight: AI boosts capabilities in banking and consumer products

*A European bank faced a dramatic increase in customer inquiries at the onset of the pandemic. With high levels of staff absenteeism from sickness and self-isolation, the company accelerated a longer-term virtual agent project to help manage the flow of calls to the contact center. Rapid implementation—inception to production in just three business days—helped the bank upgrade its capacity, and it is now handling some 2,000 customer interactions per day.⁷

*One of the world’s biggest snack companies needed a new way to evaluate demand in the face of the COVID-19 outbreak. The company implemented AI-supported demand forecasting, including a dashboard that tracks virus outbreaks, economic stress, and government regulations in addition to traditional supply chain transactional data. The solution integrates the latest relevant external and internal data to produce product, region, and channels reports; product shipment forecasts; and recommendations on production and packaging schedules.⁸

Our analysis has already revealed that companies that turned to AI to address pandemic-exposed vulnerabilities—from an inability to absorb spikes in customer-service volume to recalibrating broken or uncertain supply chains—have found AI a boon in enhancing customer engagement and maintaining operational flexibility (see sidebar, “Insight: AI boosts capabilities in banking and consumer products”).

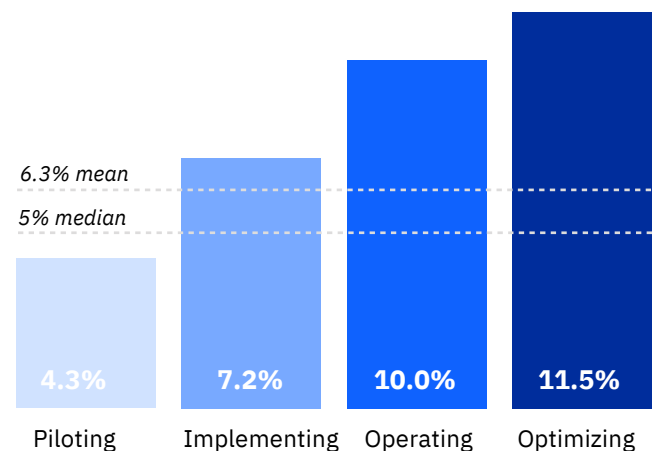
And as a consequence, nearly one-third of organizations plan to bolster their AI investments as a result of the pandemic, with 84% of executives expecting a steady or increased level of organizational focus on AI.

How AI drives financial performance

We find that organizations that adopt AI in at least a pilot phase outperform peers 2X financially, compared to those who haven’t. AI adopters report 5-6 percentage points of direct revenue gains from their AI investments. The more mature a company’s level of AI adoption, the higher that revenue advantage (see Figure 2).

Figure 2

Impact of AI on revenue by level of adoption



Source: Q: How has your investment in AI affected the annual revenue of your business unit over the past three years? Percentages represent absolute average value of increase in annual revenue attributable to AI for business unit over the past three years.

37% of organizations attribute more than a 5% revenue boost to their AI investments.

Earlier studies in our AI series—in 2016 and 2018—demonstrated that financial outperformance correlates with AI maturity.⁹ The new 2020 survey not only reaffirms that pattern but shows growing strength of the relationship. Organizations in the most-mature AI categories—operating with AI and optimizing AI—are twice as likely to be among the top-most performers, in terms of profitability, compared to organizations with average AI maturity levels.

Correlation is not causation. Perhaps outperforming companies that generate above-peer profitability have more free cash flow to invest in AI innovations, making that factor a result rather than a cause. However, the consistency of the correlative relationship over six years suggests it is mutually reinforcing, strengthened by compounding positive returns and network-effect advantages of a broader commitment to AI adoption.

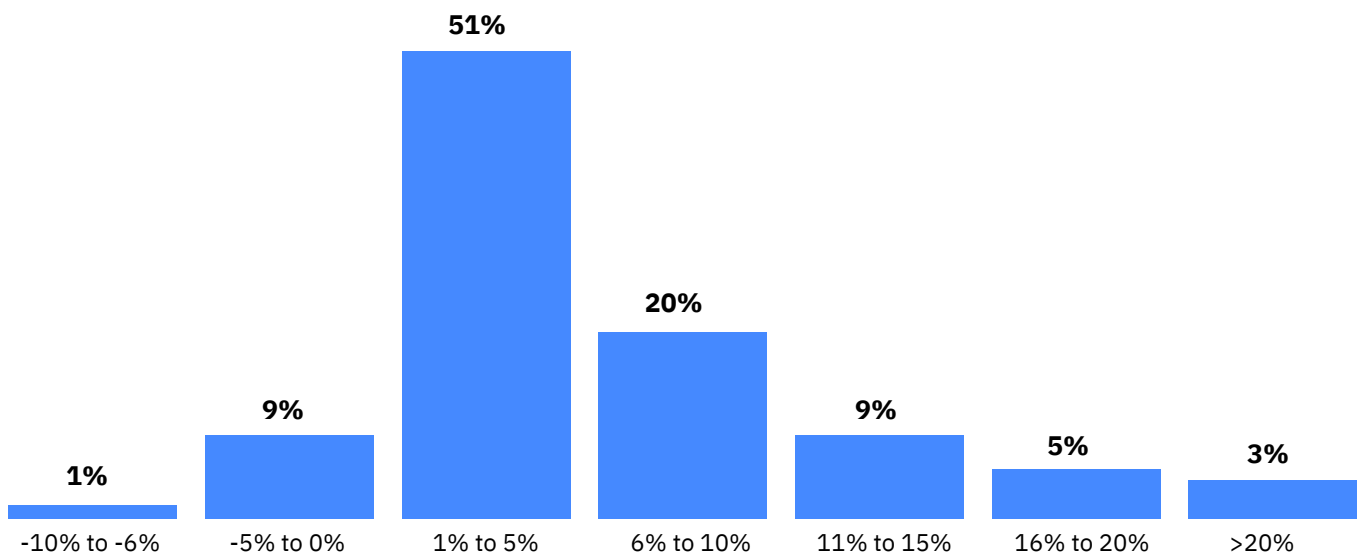
Revenue

Other results from the new survey provide even stronger evidence of a direct positive relationship between AI adoption and business performance. For example, organizations report a 6.3% increase in business unit revenue directly attributable to their AI initiatives, on average, and a 5% median rise. (Note these gains offset revenue erosion for those hit hard by the pandemic or help capitalize on new growth opportunities for those impacted more positively, financially speaking.) Fewer than 10% of respondents report a decline (see Figure 3).

Organizations in the AI piloting and implementing phase report a 4-7% revenue boost from specific AI initiatives, on average, while those in the operating and optimizing phases report an impressive 10-12% gain (see Figure 2). Virtual agent technology alone may be contributing 3% revenue gains, on average, as another recent IBV study confirms.¹⁰

Figure 3

Effect of AI investments on business unit revenue



Source: Q: How has your investment in AI affected the annual revenue of your business unit over the past three years? Percentages represent absolute average value of increase in annual revenue attributable to AI for business unit over the past three years.

IFFCO Tokio General: Using AI to improve the claims experience

A joint venture of Indian Farmers Fertiliser Cooperative Limited (IFFCO) and the Tokio Marine Group, IFFCO Tokio General Insurance Company Limited, operating in India, wanted to improve claims handling.

Up to 30% of its customers were not satisfied with the assessment of their claims. Adding an external agency to work with repair shops would improve the process but was not scalable across India.

The insurer worked with partners to build an AI-based Claim Damage Assessment Tool (CDAT). Leveraging cognitive image analytics, the CDAT analytical model uses advanced computer vision and deep neural network-based techniques to assess the type and extent of vehicle damage.

Customers upload images of damage via the app, with assessment happening almost instantly. End-to-end claims settlement time was reduced from three-to-four hours to just 15 minutes, resulting in improved customer experience and satisfaction. A bonus, IFFCO claims processing costs were reduced by 30%.¹¹

The analysis suggests that the relationship between AI maturity and revenue is nearly linear. While nothing can be a sure bet, such consistency in the relationship between AI technology adoption and financial return might be considered a convincing one. *Scaling AI* is not just a buzzy catchphrase; it's an imperative with a clear financial basis.

Network effects—even if just internal to the enterprise—appear to extend the benefits of AI investments even further. Initial analysis suggests that investing in AI in one area of business operations tends to amplify organizational adaptability and resilience in other areas, resulting in corresponding financial gains. For example, improving data governance and access policies in one function extends to adjacent functions as part of their teaming and collaboration across a workflow. This finding is especially strong for AI investments in core or *backbone* functions that have particularly strong cross-organization influence or impacts, such as finance, IT, or HR.

Cost

Our analysis also identifies cost advantages to AI investment (see sidebar, “IFFCO Tokio General: Using AI to improve the claims experience”). Executives report significant benefits to their organizations from AI investments, in terms of improvements to their operating cost. Specifically, 47% have realized cost improvements in process efficiency over the last three years, 41% in supply chain and production, and 39% headcount efficiency improvements. Only a small proportion reported net operating cost increases as a result of AI deployment.

Cost improvements are more transformational in nature among advanced AI adopters. 37% of organizations in the operating or optimizing phases of AI cite cost savings from strategic business model innovations, versus 28% for those in the piloting or implementing phases. Similarly, in the realm of end-to-end supply or production value chains, the adopters who cited cost savings are 53% versus 40%, respectively.

Results from our new survey provide even stronger evidence of a direct positive relationship between AI adoption and business performance.

Common characteristics of AI leaders

The IBM Institute for Business Value has been charting the course of AI in organizations since 2014. That longitudinal research of over 20,000 C-level executives provides us with deep historical data and context about success factors and pitfalls. And it helps us identify important AI-enabled capabilities.¹²

Across that six-year period, several distinct behaviors emerge among successful AI adopters:

- *Start with a strategic, topline-oriented mindset:* AI leaders maintain a balanced focus on profitable growth initiatives enabled by AI, with clear prioritization of the functions, workflows, and use cases that directly support business strategy. They look beyond one-dimensional, cost-driven automation—even when facing economic headwinds.
- *Prioritize targeted AI capability investments:* AI leaders engage in broad-based, staged investments to build underlying AI readiness capabilities. They prioritize cash-flow-generating AI and data projects over massive, quixotic, and often misaligned efforts. They seek and realize tangible, quantifiable benefits.
- *Adopt a human-centric attitude:* AI leaders take a deliberate, ethical, and thoughtful approach—including design, talent acquisition, and enterprise-wide tech-savvy skills development. They adopt a holistic approach to AI strategy, operating model design, team building, and culture—because AI is not just a technology play.

We have also consistently found that companies are often held back by ambiguous or ambivalent strategic objectives around AI. Many organizations are saddled with legacy technical systems and inflexible organizational structures that induce unnecessary complexity in AI planning and execution. Others simply forget that, fundamentally, technology aids people—and fail to put humans at the center of all things AI.

AI next steps: What can you do now?

AI might have seemed like an academic exercise back in 2014. But after a spate of exuberance in 2016 and experimentation in 2018, AI is coming of age in 2020.

AI has become an urgent strategic imperative. A necessity. Pandemic-era financial results demonstrate that AI is one of the most important technology innovations that organizations can employ to sustain operations experiencing unprecedented pressure. Successful AI adoption will continue to separate winners from also-rans. And distinguish a successful business from its competitors.

Following are pragmatic actions an organization can take to speed AI scaling and success—adapted from the recent IBV report on AI engineering and operations, “Proven concepts for scaling AI: From experimentation to engineering discipline”.¹³

For companies in less-mature phases of AI, such as considering, evaluating and piloting:

1. *Skip the proof-of-concept (PoC); it’s already proven.* Use a Minimum Viable Product (MVP) to lay the foundation for something larger. Initial projects should be prioritized based on business impact, complexity, and risk. Create and follow a roadmap based on impact and feasibility. If a pilot doesn’t succeed, accept it as a learning moment and move on. Don’t expect every project to reach full production. Adopting a hybrid multicloud environment aids in the ability to scale with data from various sources.
2. *Get started today, using what you did yesterday.* AI development and data governance can often take place in “bite-sized chunks” in parallel. Understand what data you have, where it resides, and who manages it, to increase confidence in outputs. AI does not necessarily require an initial massive data governance project to curate and cleanse data.

For AI to scale, you need to evaluate and iterate your models while they are in production. If it's not repeatable, it's not reliable.

3. *Adopt AI engineering principles—or else risk chaos.* Establish a small team to embed software engineering approaches (such as DevOps) into AI projects. Adjust policies and processes for the nuances of an AI environment.
4. *Measure, measure, measure.* Metrics should be mapped against key success factors and significant risks. Allow relevant internal teams to review progress and encourage feedback loops to provide input for new design and development. In AI, failure is an option, as long as companies learn from those constructive failures.
5. *Don't just align with the business—embed.* Require leaders to build AI skills and training. Focus AI projects to support larger strategic agendas. Test projects regularly for bias and transparency to help ensure the output is ethical and fair.
3. *Infuse ethics into everything.* On an ongoing basis, monitor the explainability, fairness, and robustness of your AI models. Develop inspection algorithms—"ethical bots"—that serve as virtual microscopes to search for unintended bias and other issues.
4. *Don't just operate at scale—innovate at scale.* Adopt and integrate deep, robust natural language processing capabilities and other forward-looking elements of AI matched to distinct use cases that add clear business value. Integrate disparate internal and external data sources. Adopt the mindset of an AI startup by assigning some resources to "bleeding-edge" technologies.
5. *Ask for help by engaging ecosystem partners.* Consider partnering with others to establish and/or influence relevant standards for governing AI models, drive transparency, and foster trust. Engage academics, think tanks, startups, and other trusted third parties.

For companies in more mature phases of AI, such as implementing, operating, optimizing, we offer these recommendations:

1. *Establish an AI playbook—and empower people to bring it to life.* The playbook should be a living document, with checklists and engineering principles, built upon successes, failures, and KPIs. Create an architecture and team structure – real change agents – that operates at the intersection of design and data centers.
2. *Document, document, document.* Put data scientists to work. Reinforce that deploying AI models is not the only goal or the end of a project. For AI to scale, you need to evaluate and iterate your models while they are in production. If it's not repeatable, it's not reliable—and documentation is critical for repeatability.

Study approach and methodology

In cooperation with Oxford Economics, the IBM Institute for Business Value (IBV) surveyed 6,700 C-level executives and the heads of their respective functional areas (for example, Finance, HR, Supply Chain) across 13 business functions, 28 industries, and 46 countries from February to May 2020. All participants were asked a range of questions about AI adoption, financial value, and AI-related capabilities—specifically both for their organization and the function they represent.

Related reports

Dencik, Jacob, Anthony Marshall, and Jean-Stephane Payraudeau. “Digital acceleration—Top technologies driving growth in times of crisis.” IBM Institute for Business Value. November 2020. <https://ibm.co/digital-acceleration>

Baird, Carolyn, Orrell, Gillian, and Petrone, Joseph. “The value of virtual agent technology: Improve customer service and boost financial results with AI-enabled systems.” IBM Institute for Business Value. October 2020. <https://ibm.co/virtual-agent-technology>

Muller-Stuler, Dr. Eva-Marie, Wouter Oosterbosch, and Beth Rudden. “Proven concepts for scaling AI: From experimentation to engineering discipline.” IBM Institute for Business Value. September 2020. <https://ibm.co/scaling-ai>

Notes and sources

- 1 “The Total Economic Impact™ Of IBM Watson Assistant—A Forrester Total Economic Impact Study Commissioned by IBM.” Forrester Consulting. March 2020. Note: This study estimates benefits for a composite organization based on four companies Forrester Consulting interviewed. The composite organization has attributes including \$10 billion revenue, 40,000 employees, 1 million customer conversations monthly, and implementation of three types of VAT over three years. https://www.ibm.com/watson/assets/duo/pdf/watson_assistant/The_Total_Economic_Impact_of_IBM_Watson_Assistant-March_2020_v3.pdf
- 2 Baird, Carolyn, Orrell, Gillian, and Petrone, Joseph. “The value of virtual agent technology: Improve customer service and boost financial results with AI-enabled systems.” IBM Institute for Business Value. September 2020. <https://ibm.co/virtual-agent-technology>
- 3 Smith, Chris, Brian McGuire, Ting Huang, and Gary Yang. “History of Computing.” University of Washington. December 2006. <https://courses.cs.washington.edu/courses/csep590/06au/projects/history-ai.pdf>
- 4 Latson, Jennifer. “Did Deep Blue Beat Kasparov Because of a System Glitch?” *Time*. February 17, 2015. <https://time.com/3705316/deep-blue-kasparov/>
- 5 Markoff, John. “Computer Wins on ‘Jeopardy!’: Trivial, It’s Not.” *The New York Times*. February 16, 2011. <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html>
- 6 Dencik, Jacob, Anthony Marshall, and Jean-Stephane Payraudeau. “Digital acceleration-Top technologies driving growth in times of crisis.” IBM Institute for Business Value. November 2020. <https://www.ibm.com/thought-leadership/institute-business-value/report/digital-acceleration>
- 7 Petrone, Joseph and Prad Paskaran. “Reinventing the contact center: How AI enhances experiences during turbulent times.” IBM Institute for Business Value. May 2020. <https://ibm.co/reinventing-call-center>
- 8 Aggarwal, Takshay, Amar Sanghera, Jessica Scott, and Jonathan Wright. “Smarter supply chains for an unpredictable world: Continuous intelligent planning.” IBM Institute for Business Value. August 2020. <https://ibm.co/smarter-supply-chains>
- 9 “Shifting toward Enterprise-grade AI: Confronting skills and data challenges to realize value.” IBM Institute for Business Value. September 2018. <https://www.ibm.com/thought-leadership/institute-business-value/report/enterpriseai>; Christopher, Elena, Glenn Finch, Brian C. Goehring, Cathy Reese, Thomas Reuner, and Yashih Wu. “Artificial intelligence: The killer app for data.” HFS Research and IBM Institute for Business Value. July 2018/February 2019. <https://www.ibm.com/thought-leadership/institute-business-value/report/killerappdata#>; Abercrombie, Cortnie, Rafi Ezry, Brian Goehring, Anthony Marshall, and Hiroyuki Nakayama. “Accelerating enterprise reinvention with cognitive capabilities: How to build a cognitive enterprise.” IBM Institute for Business Value. June 2017. <https://www.ibm.com/thought-leadership/institute-business-value/report/accelentreinvent>; Abercrombie, Cortnie, Rafi Ezry, Brian Goehring, Neil Isford, and Anthony Marshall. “Fast Start in cognitive innovation: Top performers share how they are moving quickly.” IBM Institute for Business Value. January 2017. <https://www.ibm.com/blogs/internet-of-things/fast-start-cognitive/>

- 10 Baird, Carolyn, Orrell, Gillian, and Petrone, Joseph. "The value of virtual agent technology: Improve customer service and boost financial results with AI-enabled systems." IBM Institute for Business Value. October 2020. <https://ibm.co/virtual-agent-technology>
- 11 "IFFCO Tokio General Insurance Company Limited: Improving customer experience with smarter solutions." IBM. July 2020. <https://www.ibm.com/case-studies/iffco-tokio-ibm-services-ai>
- 12 Goehring, Brian, Francesca Rossi, and David Zaharchuk. "Advancing AI ethics beyond compliance: From principles to practice." IBM Institute for Business Value. April 2020. <https://www.ibm.com/thought-leadership/institute-business-value/report/ai-ethics>; Brenna, Francesco, Giorgio Danesi, Glenn Finch, Brian C. Goehring, and Manish Goyal. "Shifting toward Enterprise-grade AI: Confronting skills and data challenges to realize value." IBM Institute for Business Value. September 2018. <https://www.ibm.com/thought-leadership/institute-business-value/report/enterpriseai>; Christopher, Elena, Glenn Finch, Brian C. Goehring, Cathy Reese, Thomas Reuner, and Yashih Wu. "Artificial intelligence: The killer app for data." HFS Research and IBM Institute for Business Value. July 2018/February 2019. <https://www.ibm.com/thought-leadership/institute-business-value/report/killerappdata#>; Abercrombie, Cortnie, Rafi Ezry, Brian Goehring, Anthony Marshall, and Hiroyuki Nakayama. "Accelerating enterprise reinvention with cognitive capabilities: How to build a cognitive enterprise." IBM Institute for Business Value. June 2017. <https://www.ibm.com/thought-leadership/institute-business-value/report/accelentreinvent>; Abercrombie, Cortnie, Rafi Ezry, Brian Goehring, Neil Isford, and Anthony Marshall. "Fast Start in cognitive innovation: Top performers share how they are moving quickly." IBM Institute for Business Value. January 2017. <https://www.ibm.com/blogs/internet-of-things/fast-start-cognitive/>
- 13 Muller-Stuler, Dr. Eva-Marie, Wouter Oosterbosch, and Beth Rudden. "Proven concepts for scaling AI: From experimentation to engineering discipline." IBM Institute for Business Value. September 2020. <https://ibm.co/scaling-ai>

The right partner for a changing world

At IBM, we collaborate with our clients, bringing together business insight, advanced research, and technology to give them a distinct advantage in today's rapidly changing environment.

IBM Institute for Business Value

The IBM Institute for Business Value, part of IBM Services, develops fact-based, strategic insights for senior business executives on critical public and private sector issues.

For more information

To learn more about this study or the IBM Institute for Business Value, please contact us at iibv@us.ibm.com. Follow [@IBMIBV](https://twitter.com/IBMIBV) on Twitter, and, for a full catalog of our research or to subscribe to our monthly newsletter, visit: ibm.com/ibv.

© Copyright IBM Corporation 2020

IBM Corporation
New Orchard Road
Armonk, NY 10504
Produced in the United States of America
November 2020

IBM, the IBM logo, ibm.com are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at: ibm.com/legal/copytrade.shtml.

This document is current as of the initial date of publication and may be changed by IBM at any time. Not all offerings are available in every country in which IBM operates.

THE INFORMATION IN THIS DOCUMENT IS PROVIDED “AS IS” WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING WITHOUT ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OR CONDITION OF NON-INFRINGEMENT. IBM products are warranted according to the terms and conditions of the agreements under which they are provided.

This report is intended for general guidance only. It is not intended to be a substitute for detailed research or the exercise of professional judgment. IBM shall not be responsible for any loss whatsoever sustained by any organization or person who relies on this publication.

The data used in this report may be derived from third-party sources and IBM does not independently verify, validate or audit such data. The results from the use of such data are provided on an “as is” basis and IBM makes no representations or warranties, express or implied.

